NOTES ON PLASTIC SURGERY.

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THE principles and practice of antiseptic surgery are as essential for the complete success of plastic as for that of other classes of surgical operations. Many surgeons who take "the strictest precautions" when operating on joints, take none whatever of an antiseptic nature when interfering with the rectum, the mouth and other parts whose absolute exclusion from all germs is impossible. To the believer in specific germs such a practice appears inconsistent and illogical. And I can vouch, from my own observation, that it is not unproductive of evil results. There is a kind of half-expressed but very real idea floating in the minds of many surgeons that such operations as those for hare-lip and piles are exempt from the risk of septic diseases. A few months ago I saw a surgeon most astonished that a case in which he had tied hæmorrhoids, had been attacked with erysipelas. He had operated in a general hospital and used no antiseptic precautions whatever. He did not know the recent history of the instruments, sutures or, dressings used, or of his assistants' or nurses' fingers, and yet he was astonished beyond measure when erysipelas occurred. The same surgeon would not have even aspirated the knee-joint without using the spray or the douche. It would be easy to multiply indefinitely similar instances of inconsistency.

It will be granted that all parts of the body are susceptible to septic inoculation, therefore one of the first rules of plastic surgery should be: *Thoroughly disinfect the parts to be operated on, the hands of surgeon, assistant and nurse, the instruments, sponges, ligatures, sutures and dressings.*

As a preliminary to the use of such germicides as sublimate and carbolic acid, a prolonged washing and scrubbing with the liquid potash soap of Dr. Duncan, of St. Petersburg, is very useful. This soap has two excellent properties, (1) it is an extraordinarily powerful solvent of dirt; (2) it is itself instantly soluble in cold hard water or antiseptic lotions, so that it may be said to promptly "do its business and go about its business."

But, bearing in mind that in plastic surgery, one almost always desires union by the first intention, and that irritants such as the stronger germicides are not favorable to that, *an ideal plastic operation should be aseptic rather than antiseptic.*

For this reason I generally, while keeping the instruments in a tray of carbolic, dip them into a basin of recently boiled, not boiling water[1] before touching the patient with them. But when they are even temporarily laid down again, it should be either into the tray or upon a damp carbolised towel, disposed around or near the site of the operation.

The same recently boiled, not boiling, water is used as a douche and for the sponges.

Some persons would prefer boracic lotion. I greatly doubt whether it has, for these purposes, any advantage over the boiled water. If the operation were to occupy days instead of say half an hour, it would be a different matter.

With regard to ligatures, they should scarcely ever be used in a plastic operation. Temporary pressure with sponge or forceps almost always suffices to check hæmorrhage. The boiled water used at a temperature of about 120° will assist. Hare-lip pins or silver sutures can be often arranged to not only adjust the parts but also at the same time to control an obstinate vessel.

The objections are manifest to a number of catgut knots in a wound where perfect antisepsis is impossible.

I believe it may be laid down as an axion applicable to surgery in general that *even with the aid of antiseptics, the difficul-*

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[1] A handy way in which I think aseptic, as distinguished from antiseptic, water could be quickly produced would be by adding iodide of potassium to sublimate lotion until all the mercury was precipitated, but I have never tried this plan.

ty of obtaining union in a wound without suppuration increases geometrically with the length of time a foreign body is left unabsorbed in the wound. I may not be expressing myself properly, but I mean, for instance, that when in a simple osteotomy, even though it be done antiseptically, a large splinter of bone be chipped off and left in situ, suppuration is ten times more likely than if no such splinter had been made. Very probably it is the case that, even with carefully applied antiseptics, a few germs find their way alive into the wound, but their chance of surviving and multiplying depends mainly upon their finding or not finding some dead or half dead organic nidus to receive them.

It is, therefore, particularly desirable to keep catgut out of wounds when complete antisepsis is not only difficult but often impossible.

As a prophylactic against tedious and troublesome hæmorrhage the preference of scissors to the knife for the division of all structures except occasionally the skin itself, is to be strongly urged. With regard to the skin, in dividing it the precision attainable with a sharp scalpel recommends the latter.

A classification of plastic operations may be made into two grand divisions, namely, (1) those in which flaps are transplanted, and (2) those in which they are not. As examples of the latter class may be cited the usual operations for recto-vaginal fistula and for cleft palate.

Skin flaps with pedicles should contain the fat right down to the deep fascia, but not, as a rule, that fascia itself. In this way the maximum of vitality can be secured for the flap and the minimum of damage done to the part from which it is taken. It is true that the blood-vessels which nourish the fat pierce the deep fascia, but they do so only at intervals and often in definite places described in the manuals of anatomy. Therefore in some cases they need not be divided at all by the reflection of the flap, while in others valuable and sufficient circulation is left by the anastomoses. The latter condition is particularly found in the face, from which flaps may be freely reflected with their bases in any direction and any position.

An excellent example of flaps containing large undivided

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blood-vessels is seen in a common form of operation for extroversion of the bladder. The two lateral flaps taken in case I (appended) are supplied by vessels which emerge from the saphenous opening or through the fascia lata near it. The prime importance of ample blood supply to flaps is evidenced by the extraordinary vitality of scalp flaps, which one of the older surgical writers forcibly said would survive, even if pounded up with a pestle and mortar.

Skin flaps should be reflected cleanly from the deep fascia. It is useless to take the fat if in reflecting it, the knife or scissors be allowed to chop and clip and nick it all over. The fat is not taken for itself but for the vessels which it contains and the connective tissue which contains it.

It is probably desirable to avoid needless chilling, and therefore warm douches and lotions are preferable to cold.

When a flap is to be transferred from one part to another not normally in immediate contact with it, the parts which are to give and receive the flaps respectively, should come easily together without strain and without constraint. As each may have to remain in a fixed position for a week or a fortnight, it is right that the position should be one as comfortable as can be contrived. For example, the position adopted in case II is one spontaneously taken by many persons during sleep, or is at least a near approach to it. Joints should be neither acutely flexed nor fully extended. Above all limbs should not be strongly twisted.

Fixation. The chief agents at our service are sutures, strapping, plaster of Paris, bandages and splints.

The sutures must be sufficiently strong and not too near the edge of the flaps. It is when operating on the face that the temptation is greatest to make the sutures too delicate, or to place them too near the edges of the parts sutured. It is especially near the pedicle of a flap that the sutures should be strong. There the vitality of the flap is greatest; and there, consequently, tension can be best borne. The very opposite is the case towards the extremity of the flap. In that situation great and continued tension would make sloughing almost inevitable. Sometimes, in spite of every care, the distal half of a transplanted flap perishes, while the proximal half does well.

One of the greatest advantages of the procedure which I have termed "Transplantation by Exchange," is that the thickest and most powerful sutures may be placed as deeply as the surgeon likes and left as long as he likes in the flap which is transferred *from* the face or neck. In this way the parts operated on are firmly anchored together and comparatively fine sutures suffice for the flap transferred *to* the face. See case II.

As a rule, silver is the best material for the sutures of the plastic operations. It does not absorb discharges as silk does, and it does not stick to its bed like catgut; it can therefore be removed on any day without causing disturbance.

When the position of some of the sutures is such that they can only be inserted with difficulty while the parts to be joined are placed together, tags may be inserted into the parts whilst they are separate and tied or twisted together when the parts are approximated. This, however, is not a plan which is often useful.

The order in which sutures should be placed resembles that in which a painter's canvas is nailed to its wooden frame-work. Salient and opposite points are adjusted first and afterwards other points between these and so on.

A thorough douching should follow the suturing, and then dressings should be applied and secured—of these, more by and by.

Strapping.—This article, of the best quality and in long, broad strips, should be freely used to fix together parts placed in contact for purposes of transplantation. No bandages whatever can be compared with strapping for this purpose.

Plaster of Paris.—Well-fitting cases or splints of plaster bandages over flannel or woven bandages admirably protect and secure parts previously fixed with strapping. Any little (or even considerable) soaking with discharge or saliva during the ten days they are perhaps left in position is a trivial matter compared with the end attained. Sometimes the soaked part can be cut away without spoiling the case. Plaster cases for the purpose in question do not need to be thick and heavy.

Splints of wood or of poroplastic or of some other material often suffice.

With regard to bandages, it is well known that those of carbolised gauze are the best for keeping in place, and calico ones perhaps the worst.

Two important questions are: (1) *How long should sutures be left in situ* when neither of the parts united is to be severed from its original attachment, and (2) *On what day should we divide the pedicle of a flap* which is to be completely separated from its original site.

The answer to the former question depends on the amount of tension, on the age of the patient and on the "vitality" of the parts. Four days sometimes suffice, but often a week at least should be given, and it is better to err on the side of excess than on the other side.

Ten days is not too long to wait before dividing a pedicle of a flap.

When the pedicle is divided it must be adjusted, and, if necessary, sutured to the corresponding border of the space in which it now lies. At the same time the other margins of the flap may be found to require readjustment. But the greatest gentleness and very delicate handling must be practised at this early period. Careful dressings of iodoform gauze or boracic lint or ointment must be persevered with until healing is complete.

An inconvenience which is unavoidable is the tendency of the wound to contract *while* the transplanted part is forming adhesions to it. When once the adhesions are formed and, so to speak, confirmed this tendency may cease. But, in the meantime, supposing wound and flap to have been originally exactly the same size, an appearance will have resulted of the flap having been originally cut too large. The contraction all round the flap also raises it, and it appears too thick as well as too great in area. This thickness can be reduced by pressure, and the pressure can be conveniently applied to small areas by means of a large coin wrapped up in lint and fixed by strapping. In spite of all this, I should be loth to cut a flap smaller than the wound it was to fill. I am writing now of such a wound as that made by the excision of a mole on the face [*e. g.* case II.] Instead of the size of "the wound" I should have said the size of "the part removed." It is to the latter, before the parts are disturbed that the size of the flap to take its place should be adjusted, for, of course, when once the knife has touched either part, retraction commences. When transplantation is done to counteract contraction after, *e. g.*, a burn, it is seldom necessary to be exceedingly particular about the size of the flap. Its position and origin are far more important.

The readjustment of a flap, or of a part of it, may be so extensive as to amount to a second transplantation of the whole or of a great part of it. This might be called "*transplantation by two stages.*" For example' in a case where "wry-neck" followed a burn the first object, namely to get a flap from the shoulder to the neck could not possibly be achieved at the same time as the perfect arrangment of the transplanted flap in its ultimate position, because the position of the head and neck while the shoulder was attached to it, "folded up," as it was, the wound in the neck. When such a two-stage operation has to be done, weeks if not months should be allowed to pass between the transplantation and the replantation. Because it must be long before a transplanted flap obtains, through any of its borders, a blood supply nearly comparable to that which it had through the pedicle which once attached it to its original situation. Indeed it perhaps never does. Sometimes one can plainly observe a transplanted flap pale while the surrounding skin blushes.

In plastic operations one should avoid attempting to do too much and especially too much at one stage. For instance in case I, the effect of attempting to completely close in the cavity of the bladder, leaving only a small orifice about, say, the calibre of a normal urethra, would have been to force urine to escape in different situations, and, perhaps, to prevent union of the flaps here and there or even all over.

Another ill effect of attempting to do too much at one time is that it leads us to exercise too much tension, than which nothing can be more unfavorable to union.

Flaps may contain other structures besides skin, in fact any tissue of the body. In Pirogoff's amputation we have a plastic operation in which a flap contains bone, namely part of the os calcis. Flaps containing bone have been used in operations for the formation of a new nose. Flaps containing periosteum are used in operations for cleft of the hard palate. In these instances the deeper structures are preserved for their own sakes. In case III all the soft structures of the sole and sides of the foot are preserved for the sake of the nutrition of the skin, the immediate object being to preserve the plantar arteries. But, as a rule, the structures below the deep fascia are useless in a flap, and, as also interference with them increases hæmorrhage, and the injury to the region from which they are removed, they should be let alone.

When a surface has to be refreshed or made raw it is a well-recognized rule to avoid taking away and wasting tissue wantonly. But it is absurd to be finicky over mere cicatricial tissue, as I have sometimes seen surgeons be when dealing with ruptured perineum and recto-vaginal fistula, cicatricial tissue is easily distinguished, and, being inferior in vitality, is best removed.

A typical instance in which the refreshing should be done with little or no clipping away of tissue is furnished by the operation of closing an old and cicatrised slit in the cheek.

Until cicatricial tissue is removed, it is impossible to distinguish and separate into natural layers, skin, muscle, etc. Unless this be done, buried sutures cannot be used to the best advantage.

Buried sutures are of the greatest value in many plastic procedures. They not only insure union, but they prevent depressed cicatrices, and often restore the functions of deep parts, such as tendons and nerves, in a manner that cannot be rivaled by any other means.

To illustrate the application of the principles noticed above I append a few cases, briefly sketched.

CASE I. *Extroversion of the Bladder.* An ordinary example. Patient boy aged about 10. His clothes being constantly wet with urine, the poor lad had, as is usual in such cases, a strong urinous odor, and the skin over the hypogastrium and the groin was covered with an erythematous eruption. The appearance presented by the extroverted bladder was aptly compared by the ward nurse to a tomato.

The erythema having been greatly lessened by the use of unguents for a few days, the parts were, the patient being anæsthetized, very carefully cleansed and asepticised as much as possible. The operation performed was that in which three flaps are cut: (1). A median one which has its base towards the bladder and its distal extremity towards the umbilicus. (2 and 3). Two lateral ones, each with its base towards the saphenous opening and its inner border alongside the bladder. These flaps took in all the soft parts down to and, in this case, including the deep fascia. Therefore the aponeurosis beneath was exposed. An operation like this differs essentially from a plastic operation on the face or neck, in that the prime indication is to obtain powerful, well nourished flaps and a deep, strongly marked cicatrix is comparatively unobjectionable.

The flaps were first outlined with an aniline pencil, and then immediately with the knife, for the aniline soon washes off. The knife is next made to cut down and through the deep fascia at one spot, and then a director is passed beneath the deep fascia, and, with its aid the outline of the corresponding flap cut everywhere completely and quickly to the required depth.

In many plastic operations a little reflection will discover a reason for turning back one flap or for refreshing one surface before another. In this case it was best to reflect the median flap before the lateral flaps; because the first was closely attached to the linea alba and had to be carefully cut and snipped free, while the last were easily stripped back, scarcely requiring a touch of knife or scissors. Therefore the first bled most and longest. It saves time to deal first with the parts in which the most hemorrhage is likely to be caused. This bleeding can usually be stopped by pressure kept up while the other parts are being dealt with. A sponge should be put on and kept on, not renewed from time to him. Hæmorrhage is not checked by "dabbing" a sponge on and off.

As the scissors snip the attachments of a flap, they should cut away from and not into the flap.

Wells' or Pean's forceps should be placed on bleeding points of any size. They were used in the case under description, and not a single ligature.

As, in this operation, the median flap has to be turned down and the two side flaps brought over it until they cover it and meet one another in the middle line, three sets of sutures are required, viz.: (1). To join together the two lateral flaps. (2). To join them to the median flap beneath. (3). To bring together the edges of the gaps left by the reflected flaps. There is scope for a little ingenuity in arranging the third set. They should be placed in the way best calculated not only to cause least tension on themselves, but also to take tension off the transplanted flaps. Hare-lip pins and twisted sutures are the best for the first and third sets. For the second set I employed in this case two stout silver sutures, each fixed to a round and flat lead button. These buttons lay in contact with the badder, and the sutures being carried perpendicularly through first the median flap and secondly the lateral flaps (one to each) were tightened and secured with lead split shot.

The parts having been well douched, were dressed with iodoform gauze. The patient was then sent to bed with his legs crossed and his thighs moderately bent on his abdomen. This position thoroughly relaxed the parts. He was kept in a half sitting position for a week, so that the urine might not flow over the groins and the flaps, by which time very good union was obtained: but the sutures were not all removed for a fortnight.

A second operation of a simple description, without flaps had to be done to reduce the size of the orifice into the bladder. This gave the patient power to pass all his urine into a urinal. He is therefore now entirely free from his old discomforts, and instead of the old tomato-like tumour has a hypogastrium disfigured only by a few cicatricial lines and a small aperture through which the urine flows. I have not interfered with the epispadias yet: perhaps I never shall. I of course feel some anxiety lest pubic hairs should grow into the bladder, but if they do, I think I am prepared to deal with the misfortune.

CASE II. That of a female infant three weeks old with a hairy mole covering nearly the whole of its left cheek, the hairy mole of the face exchanged with a patch of smooth white skin taken from the arm.

On April 2, 1886, at the West London Hospital the little patient being anæsthetized, I first thoroughly cleansed and disinfected the cheek and arm with liquid potash soap (Duncan's) and solution of perchloride of mercury, successively. Next I marked out the flaps in the following manner: A straight ink-line was drawn from *A* to *B* (see illustration). The arm was then placed in comfortable position, arching upwards over the face and head. The wet ink on the line *A B* printed a second line on the arm at *C D*. A paper pattern of the flap to be removed from the face was cut, and with its aid an exactly similar flap was marked out on the arm, so that *C D H G* on the arm corresponded to *B A E F* on the face, each letter to each respectively. Though this is a very simple matter, some care is required in practice to avoid confusion.

The face flap was reflected first. It included the subcutaneous fat proper, which had to be carefully separated from the cushion of fat which swells out into the middle of the cheek from beneath the ramus of the jaw; and it was necessary also to cut very carefully and *see* everything which was divided near the parotid and some of the branches of the facial nerve. The structures in an infant's face are, of course, comparatively small and near to each other, and the amount of fat is, comparatively, very considerable. Almost all the cutting throughout the operation was done with scissors, and not very sharp ones either. The main object of this was that bleeding might stop rapidly, and thus dry surfaces be obtained speedily—a very important matter in a plastic operation. This object was entirely attained in the case I am describing. The arm flap also included the fat down to the deep fascia.

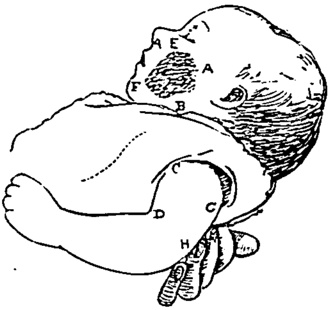

Fig 1. Mole of Face to be Exchanged for Skin from Arm.

The angles between the arm and face, near the flaps, were now packed with iodoform gauze, and the whole arm was most carefully fixed to the head and neck with good strapping. Finally, over sufficient flannel and wadding, the head and thorax and *both* arms were rigidly secured in plaster-of-Paris. The whole had somewhat the appearance of a large egg with an infant's face peering out of a hole near one end and its hips projecting and legs kicking freely out of the other end. The child's conduct showed that it was free not only from pain, but even from discomfort.

The following notes of the after-treatment were made by the house surgeon, Mr. Harold Des Vœux: April 9 (seven days after operation): Part of case removed, dressings found to be very offensive; both flaps looking well, though the face flap is red and the stitches along its anterior border have given way; dressed as before. 13. Whole case removed and bases of flaps cut and sutured respectively to face and arm. This, of course, liberated the arm from the head and severed each of the two transplanted flaps from its original connections, completing the exchange of places. At the lower and outer border the flap upon the face was found to be not adherent and partially redundant, owing to cicatricial contraction of the face-wound; it was therefore pared to fit, and re-sutured to the face. Wounds dusted with iodoform; both arms strapped to body to prevent child from scratching the wounds. 20. The face flap not fitting perfectly in one or two places, it was there refreshed, adjusted, and fixed with fine horse-hair sutures.

The following account of the state of the case, nine months after the operation, is written by Mr. C. H. Taylor, house physician to the West London Hospital, who has just visited the little patient to report on it: "The child is much fatter and healthier in appearance; the transplanted skin on the face is of the same colour and appearance as the rest of the face; all that is noticed is an incomplete, irregular ring of depressions, or dimples and linear scars, these being slightly paler in colour than the surrounding skin. At the outer and lower edge nearest the ear are two small patches of mole, one about the size of a pea and the other smaller;[1] they are pale-brown in colour, and have a few silky hairs growing from them. The arm is much fatter, and the mole upon it is more raised and movable than it was upon the face, but it remains the same in size.

There can, therefore, be no doubt about the satisfactory results attained by this mode of operating, which is, to the best of my belief, new. It is obviously a very great advantage to be able to anchor, so to speak, the arm to the head by the strong sutures which unite the former to the transplanted mole. It is thus rendered needless to put any except fine sutures into the face. Secondly, the bases or necks of the two flaps, lying with their raw surfaces in mutual contact, help to keep up each other's warmth and nutrition. Thirdly, not only is the risk of sloughing diminished, but should the part removed from the arm slough, the mole saved from the face is there covering the arm-wound with healthy and supple, though discolored and abnormal, skin. I cannot help thinking this plan of preserving what might be termed "healthy disfigurements" of the face, such as hairy moles, and exchanging them for skin taken from parts usually hidden by the clothes, to be a great improvement on the practice of excising such moles and wasting them.

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[1] These small patches lay near the border of the large mole when it was transplanted, and were left behind. Other details of this case are given in the *London Lancet*, February 19, 1887.

CASE III. A "modified Syme," a plastic operation by which the sole of the foot is transferred to the front of the leg, covering the *shin* where it had been laid bare by an ulcer.

John J., aged 46, suffered from an ulcer which extended from the junction of the upper and middle thirds of the leg down to about two inches from the ankle-joint, and passed round towards the posterior aspect of the limb, so as to leave a breadth of sound skin, only two inches wide, for a short distance. He applied at the West London Hospital, asking not to have the ulcer healed, but to have the leg amputated. He knew, by experience, that the healing of such an ulcer, even if possible, was a delusion and a snare.

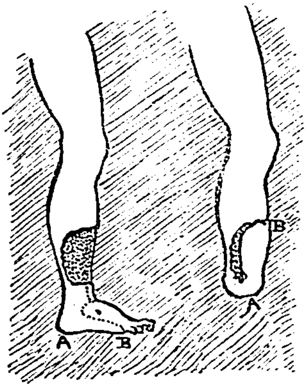

FIG. 2. AMPUTATION OF FOOT, WITH USE OF SOLE AS FLAP TO COVER ULCER OF LEG. 1, showing site of ulcer and direction of incisions to make flap. 2, flap in place at end of operation.

Measurements showed that the soft tissues of the sides and sole of the foot would be sufficient to cover the whole length of the ulcer, provided an inch was sawed off the tibia, but that a strip of ulcer, about two inches wide, would remain uncovered on each side of the leg. It was necessary also to bear in mind that when the granulations and untrustworthy borders were scraped away there would be further retraction. I should say that the size of the ulcer, as I have above described it, was its size when greatly diminished by two months' rest and treatment in hospital, owing to a severe attack of erysipelas which had nearly been fatal.

The operation is described in detail in the *Lancet* of November 28, 1885. The principles recommended above were carried out in this case; and the patient was shown in excellent health and with a sound leg, flap and stump at the London Clinical Society on November 13 (three months after the amputation). But even six weeks after the operation he had thoroughly convalesced as regards the local appearances. The diagrams explain pretty clearly what was done. All the soft tissues of the sole and sides of the foot, except loose tendons, were included in the flap transferred to the shin.

Where the edges of the flap did not reach the sides of the raw surface to be covered, no stretching was employed, but silver sutures were carried across little "bridges" of lead.

I will deal with the use of buried sutures in plastic operations (especially when performed on the perineum or on the face and head) and with transplantation without pedicle in a future contribution.